

**REMARKS**

**I. Preliminary Matters**

Upon entry of the Amendment, which is respectfully requested, claims 1-8 and 10-30 will be pending in the present application. Claim 27 is withdrawn from consideration as being drawn to non-elected species.

Claims 1-5 and 12-16 are amended to recite a specific range of pressure at which the oxide film forming method is carried out, with support in the present specification at page 17, lines 1-4. Claims 1 and 12 are further amended to recite that one of the two components of the process gas is a reactive oxidizing gas (B), with support in the present specification at page 10, lines 6-7.

Claims 6-8, 17-18 and 21 are amended to delete the phrases “such as... or the like”. Claims 20, 22 and 23 are amended to correct antecedent basis for certain terms. Claim 29 is amended to clearly define the gas flow regulating plate.

Claims 6, 8, 10 and 11 are amended to depend from any one of claims 1 to 5. Claim 7 is amended to depend from any one of claims 2 to 5. Claims 18-20 are amended to depend from any one of claims 13 to 16. Claims 21-23 and 25 is amended to depend from any one of claims 12 to 16. Claim 28 is amended to depend from claim 25.

Claim 9 is canceled without prejudice or disclaimer.

Claim 30 is added, with support in the present specification at page 21, lines 16-19.

No new matter is added, and therefore, entry of the Amendment is respectfully requested as being proper and appropriate.

## **II. Response to Claim Objections**

Claims 6-8, 10-11, 18-26 and 28-29 are objected to for being in improper form because a multiple dependent claims cannot depend from another multiple dependent claim. Claims 6, 8 and 17 are further objected to for including abbreviations in the claim language.

Applicants submit that the amendments to claims 6-8, 10-11, 18-23, 25 and 28 obviates the objection to claims 6-8, 10-11, 18-26 and 28-29, as being of improper dependent form. Accordingly, Applicants respectfully request reconsideration and withdrawal of the claim objections.

## **III. Response to Claim Rejections Under 35 U.S.C. § 112**

**A. Claims 1 and 9-11 are rejected under 35 U.S.C. § 112, first paragraph, allegedly for lack of enablement.** Specifically, the Examiner asserts that claim 1 recites “a method for forming an oxide film on the surface of the substrate” (emphasis added). However, claim 1 does not recite the use of oxygen-containing gas or oxygen-containing material, which, in the Examiner’s opinion, is essential for the formation of an “oxide film”. Claims 9-11 are included in the rejection by virtue of their dependence from claim 1.

Initially, without acquiescing to the merits, claim 9 is canceled.

Claim 1 is amended to recites that one of the two components of the process gas is a reactive oxidizing gas (B).

In view of the above, Applicants submit that the § 112, first paragraph rejection of claims 1 and 10-11 is overcome, and therefore, respectfully request reconsideration and withdrawal of the rejection.

**B. Claims 1-26 and 28-29 are rejected under 35 U.S.C. § 112, second paragraph as allegedly being indefinite, as discussed below.**

Claims 1-5 and 12-16 are rejected because the phrase “close to the atmospheric pressure” (emphasis added) is subjective, vague and indefinite.

Claims 1-5 and 12-16 are amended to recite a specific pressure range at which the oxide film formation method of the presently claimed invention is carried out. Accordingly, Applicants submit that the claims are not indefinite, and respectfully request reconsideration and withdrawal of the rejection.

Claims 6-8, 17-18 and 21 are rejected because the phrases “such as” and “or the like” render the claims indefinite because it is unclear whether the elements following the phrases are included within the scope of the claims.

Applicants respectfully submit that the amendments to claims 6-8, 17-18 and 21 obviate that alleged indefiniteness of the claim language, and therefore, Applicants respectfully request reconsideration and withdrawal of the rejection.

Claims 6-8 are further rejected because the claims recite a method, but is dependent from claims that recite an apparatus.

Claims 6-8 are amended to depend from claims 1-5, and claims 1-5 are drawn to a method of formation of an oxide film. Accordingly, the § 112, second paragraph rejection of the claims is overcome, and Applicants respectfully request reconsideration and withdrawal of the rejection.

Claims 22 and 23 are rejected because various terms in the language of the claims lack antecedent bases.

Applicants respectfully submit that the amendments to claims 22 and 23 obviates the § 112, second paragraph rejection for lack of antecedent basis. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

**Claims 9-11, 20, 24-26 and 28-29** are included in the § 112, second paragraph rejection because the claims depend from indefinite claims.

Initially, without acquiescing to the merits, claim 9 is canceled.

Claims 10-11, 20, 25 and 28 are amended to correct dependency, and therefore, the § 112, second paragraph rejection of claims 9-11, 20, 24-26 and 28-29, is overcome. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection.

### **III. Response to Claim Rejections Under 35 U.S.C. § 103**

**A. Claims 1-7, 9-21, 25-26 and 28 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ikeda (U.S. Patent No. 5,593,741) in view of Jain et al. (U.S. Patent No. 6,465,044). Applicants respectfully traverse, for at least the following reasons.**

The present invention relates to the performance of chemical vapor deposition (CVD) on a substrate under a condition close to atmospheric pressure ( $1.0 \times 10^4 - 11.0 \times 10^4$  Pa) as explained at page 17 of the original specification. First, a process gas (B) is discharged and next the process gas (B) is mixed with a process gas (A) that is not discharged in the vicinity of the surface of the substrate.

#### **(i) Non-Obviousness of Combining Ikeda and Jain**

Ikeda teaches a plasma-enhanced chemical vapor deposition (CVD) process for depositing a silicon oxide film on a substrate using a silicon-containing organic precursor, for example, tetraethoxysilane (TEOS), tetramethylsilane, triethoxysilane,

tetramethycyclotetrasiloxane, octamethylcyclotetrasiloxane, hexamethyldisilazane, tris(dimethylamino)silane and tris(diethylamino)silane. The process is performed at low pressure (1.0 to tens Torr) and the substrate must be placed in a reaction chamber that is evacuated.

As the Examiner admits at page 8 of the Office Action, Ikeda differs from the present invention because the process of Ikeda is a low pressure process. In fact, at column 5, lines 23-24, it is disclosed that the pressure of the reaction chamber is maintained at a predetermined reduced pressure which ranges from about 0.1 Torr to tens of Torr, which is far lower than the pressure at which the presently claimed invention operates, i.e.,  $1.0 \times 10^4$  to  $11 \times 10^4$  Pa or ~75 to 825 Torr. The Examiner relies on Jain to cure the above deficiency in Ikeda.

Jain teaches a CVD method of depositing silicon oxide films on the surface of semiconductor substrates using alkylsiloxane precursors and ozone. At column 2, lines 34-37 of Jain, it is disclosed that the method of Jain is of particular advantage because the process is a thermal CVD method and does not require the complex addition of plasma CVD technologies. The mixed gasses are not discharged but are only sprayed on a surface of the substrate. Furthermore, the organic precursors used in Jain are alkylsiloxane precursors of the formula  $(\text{CH}_3)_3\text{Si}[\text{OSi}(\text{CH}_3)_2]_n\text{OSi}(\text{CH}_3)_3$ , where  $n=1$  and  $2$ , which is different from the precursors used in Ikeda. Additionally, at column 2, lines 42-47, it is disclosed that the siloxane-containing precursors used in the CVD process of Jain results in lower chemical usage and excellent gap filling properties as opposed to TEOS used in plasma-enhanced CVD methods.

In view of the above, the CVD methods disclosed in Ikeda and Jain are different, being directed to a plasma-enhanced and non-plasma CVD methods, respectively, and using different organic precursor materials. Therefore, a person of ordinary skill in the art would not perform

the process of Ikeda at the pressure disclosed in Jain, and there is no motivation to combine the two references.

(ii) Combination of Ikeda and Jain will not result in the presently claimed invention

Ikeda does not discuss the amount of silicon-containing gas and oxidizing gas used in the reaction process. At column 4, lines 43-48 of Jain it is disclosed that when operating at atmospheric pressure, the molar ratio of ozone to silicon is in the range of approximately 3 to 20 mol%, more preferably 5 to 15 mol%, with an  $O_3:Si$  ratio of 6 to 14 mol% being most preferred.

In contrast, at page 10, lines 8-11, the present specification teaches that the quantity of the process gas (B), i.e., the oxidizing gas equivalent to  $O_3$  of Jain, out of the process gases used in the CVD method is in excess of 50 weight% of the whole process gas. At page 10, lines 13-14, it is further disclosed that when  $O_2$  or  $N_2O$  of the process gas (B) is less than 50 weight %, a decrease in the membranous property of the film is observed, which is not desirable. If, for example, a process in the present application involves the use of  $O_2$  and  $Si(OCH_3)_4$ , 50 weight % of  $O_2$  is approximately equal to 80 mol % of  $O_2$  in the gaseous mixture. This value falls outside of the ranges disclosed in Jain. In fact, the ranges disclosed in Jain would fall below the 50 wt % of process gas (B), as desired in the present invention. As a result, using the amounts of process gases disclosed in Jain in the process of Ikeda, the silicon oxide film arrived at would be of low membranous quality.

In sum, neither reference discloses a system in which first a process gas (B) is discharged and next the process gas is mixed with a process gas (A) not discharged in the vicinity of the substrate.

Therefore, even if a person of ordinary skill in the art were to combine the processes of Ikeda with Jain, the presently claimed invention would not be achieved because of the difference in the amounts of process gases used in the reactions.

In view of the above, Applicants submit that claims 1-5 and 12-16 are patentable over Ikeda in view of Jain. Claims 6-7, 10-11, 17-21, 25-26 and 28 are also patentable, at least by virtue of their dependence from claims 1-5 and 12-16. Accordingly, Applicants respectfully request reconsideration and withdrawal of the § 103 rejection of claims 1-7, 9-21, 25-26 and 28 based on Ikeda in view of Jain. Applicants also submit that claim 30 is also patentable over Ikeda and Jain, at least by virtue of its dependence from any one of claims 2-5.

**B. Claim 8 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ikeda and Jain and further in view of Nguyen et al. (U.S. Patent No. 6,489,255); Claim 22 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ikeda and Jain and further in view of Fonash et al. (U.S. Patent Application Publication No. 2002/0094388); and, Claim 29 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ikeda and Jain and further in view of Bang et al. (U.S. Patent No. 6,110,556). Applicants respectfully traverse.**

Claims 8, 22 and 29 are patentable over Ikeda and Jain, at least by virtue of their dependence from claims 1-5, and 12, and further because none of Nguyen, Fonash and Bang cure the deficiencies in Ikeda and Jain, as discussed above. Accordingly, Applicants respectfully request reconsideration and withdrawal of the § 103 rejections of claims 8, 22 and 29.

#### **Conclusion**

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the

Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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